

Amendment and Response

Applicant: Hong-Jyh Li

Serial No.: 10/816,503

Filed: April 1, 2004

Docket No.: I331.128.101/2004P51130US

Title: PLASMA ION IMPLANTATION SYSTEM

REMARKS

The following remarks are made in response to the Non-Final Office Action mailed June 14, 2007. Claims 1-31 were rejected. With this response, claims 1, 8, 16, and 25 have been amended, and claims 2, 10, and 26 have been cancelled. Claims 1, 3-9, 11-25, and 27-31 remain pending in the application and are presented for reconsideration and allowance.

Claim Rejections under 35 U.S.C. § 103

The Examiner rejected claims 1, 2, 4-10, 12, 25, 26, 28, and 29 under 35 U.S.C. § 103(a) as being unpatentable over Collins et al., U.S. Patent No. 6,518,195 ("Collins") in view of Jeon, U.S. Patent No. 6,790,755 ("Jeon").

Collins and Jeon, either alone, or in combination, fail to teach or suggest the limitations recited by amended independent claim 1 including a **plasma generator configured to generate ions other than N in the vacuum chamber**.

Collins discloses a domed plasma reactor chamber that uses an antenna driven by RF energy that is inductively coupled inside the reactor dome. The antenna generates a high density, low energy plasma inside the chamber for etching metals, dielectrics, and semiconductor materials. (Abstract). Collins discloses specific process aspects including etching oxide; "light" etching of silicon oxide and polysilicon; high rate isotropic and anisotropic oxide etching; etching polysilicon conductors; photoresist stripping; anisotropic etching of single crystal silicon; anisotropic photoresist etching; low pressure plasma deposition of nitride and oxynitride; high pressure isotropic conformal deposition of oxide, oxynitride, and nitride; etching metals; and sputter facet deposition, locally and globally, and with planarization. (Col. 6, lines 5-17).

Jeon discloses a layered dielectric structure comprising an alternating pattern of at least two sub-layers of a first dielectric material which is a high-K dielectric material and at least one layer of a second dielectric material which is a standard-K dielectric material, wherein at least one of the one or more second dielectric material sub-layers contain nitrogen implanted therein using a nitridation step. (Abstract).

The Examiner admits that Collins fails to disclose implanting ions into a high-k dielectric layer. (Office Action, page 5). Both Collins and Jeon fail to teach or suggest implanting ions *other than N* into a *high-k dielectric layer*. Therefore, it would not have been obvious to one of ordinary skill in the art to combine the plasma reactor disclosed by Collins

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and the nitridation step disclosed by Jeon to implant a high-k dielectric layer with ions other than N as recited by independent claim 1.

In view of the above, Applicant submits that the above rejection of independent claim 1 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claim 2 has been cancelled. Dependent claims 4-7 further define patentably distinct independent claim 1. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 1 and 4-7 is respectfully requested.

For similar reasons as discussed above with reference to independent claim 1, Collins and Jeon, either alone, or in combination, also fail to teach or suggest the limitations recited by amended independent claim 8 including **a plasma generator configured to generate ions other than N from the gas.**

In view of the above, Applicant submits that the above rejection of independent claim 8 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claim 10 has been cancelled. Dependent claims 9 and 12 further define patentably distinct independent claim 8. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 8, 9, and 12 is respectfully requested.

For similar reasons as discussed above with reference to independent claim 1, Collins and Jeon, either alone, or in combination, also fail to teach or suggest the limitations recited by amended independent claim 25 including **generating a plasma comprising ions other than N in the vacuum chamber from the gas.**

In view of the above, Applicant submits that the above rejection of independent claim 25 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claim 26 has been cancelled. Dependent claims 28 and 29 further define patentably distinct independent claim 25. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 25, 28, and 29 is respectfully requested.

The Examiner rejected claims 3, 11, 13-24, and 27 under 35 U.S.C. § 103(a) as being unpatentable over Collins and Jeon in view of Yamada et al., U.S. Patent App. Pub. No. 2001/0054746 ("Yamada").

Dependent claims 3, 11, 13-15, and 27 further define patentably distinct independent claim 1, 8, or 25. Accordingly, Applicant believes that these dependent claims are also

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allowable over the cited references. Allowance of claims 3, 11, 13-15, and 27 is respectfully requested.

Collins, Jeon, and Yamada, either alone, or in combination, fail to teach or suggest the limitations recited by amended independent claim 16 including a **plasma generator configured to generate ions from the gas, the ions comprising one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, B, Al, Ga, In, Ge, C, and Sb.**

Yamada discloses a bipolar transistor. Yamada discloses that an n-type impurity such as phosphorus (P) or arsenic (As) is ion-implanted through an opening in the mask 200 to locally change the SOI silicon layer 3 into the n-type collector region with a uniform concentration. (Para. 0138).

Yamada does not disclose ion-implanting a *high-k dielectric layer*. Yamada merely discloses forming a collector region for a BJT. In addition, neither Collins, Jeon, nor Yamada disclose implanting a *high-k dielectric layer* with ions comprising one of *F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, B, Al, Ga, In, Ge, C, and Sb.*

In view of the above, Applicant submits that the above rejection of independent claim 16 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claims 17-24 further define patentably distinct independent claim 16. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 16-24 is respectfully requested.

The Examiner rejected claims 30 and 31 under 35 U.S.C. § 103(a) as being unpatentable over Collins and Jeon in view of Wu et al., U.S. Patent No. 6,248,662 ("Wu").

Dependent claims 30 and 31 further define patentably distinct independent claim 25. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 30 and 31 is respectfully requested.

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CONCLUSION

In view of the above, Applicant respectfully submits that pending claims 1, 3-9, 11-25, and 27-31 are in form for allowance and are not taught or suggested by the cited references. Therefore, reconsideration and withdrawal of the rejections and allowance of claims 1, 3-9, 11-25, and 27-31 is respectfully requested.

No fees are required under 37 C.F.R. 1.16(b)(c). However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 50-0471.

The Examiner is invited to contact the Applicant's representative at the below-listed telephone numbers to facilitate prosecution of this application.

Any inquiry regarding this Amendment and Response should be directed to Mark A. Peterson at Telephone No. (612) 573-0120, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

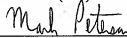
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Respectfully submitted,

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